

Translated from French by
SCIENTIFIC TRANSLATION SERVICES
411 Wyntre Lea Dr.
Bryn Mawr, PA 19010

International Application No. PCT/FR 03/50033

CLAIMS

1. Method for the optical emission spectroscopy of a said liquid (301) excited by a said pulsed laser (402) focused on its surface, characterized in that the said zone to be analyzed (304) is swept by a said laminar gas flow (309) having sufficient velocity and cross sectional area to eliminate the residues of the plasma suspended in the gas and resulting from a first pulsed laser, before the next pulsed laser takes place, so that the laminar gas flow creates a containment effect on the free surface of the liquid.

2. Method in accordance with claim 1, characterized in that the velocity of the gas is determined according to at least one of the following properties of the analyzed liquid: its temperature, its viscosity, its flow rate, the turbulent or laminar nature of its flow.

3. Method in accordance with one of the claims 1 or 2, characterized in that the cross section swept by the laminar gas flow is determined according to at least one of the following properties: rate of expansion of the plasma, rate of recurrence of the laser pulses, accuracy of the measurement.

4. Method in accordance with one of the above claims, characterized in that the liquid is flowing in the zone to be analyzed.

5. Method in accordance with one of the above claims, characterized in that the gas is led into the zone to be analyzed through a conduit (313, 302) surrounding the conduit (302) of the analyzed liquid.

6. Method in accordance with one of the above claims, characterized in that the laser beam is inclined in relation to the plane formed by the surface of the liquid at an angle different from 90°.

7. Method in accordance with claim 6, characterized in that the laser beam is inclined in relation to the plane formed by the surface of the liquid at an angle greater than 60°.

8. Method in accordance with one of the above claims, characterized in that the beam emitted by the liquid after excitation by the laser beam is collected colinearly with the laser beam.

9. Method in accordance with one of the above claims, characterized in that the gas is argon or helium.

10. Device for the optical emission spectroscopy of a liquid excited by a pulsed laser focused on the surface of this liquid, characterized in that it comprises:

- a laser capable of generating coherent light pulses of a power density of at least 1 Gw/cm²,

- means capable of generating a laminar jet of liquid to be analyzed over a length of at least one cm,

- means capable of generating a laminar gas jet parallel to the surface of the liquid to be analyzed, and in contact with it, eliminating the residues of the plasma suspended in the gas and resulting from a first pulsed laser,

- means capable of focusing the laser beam in the zone to be analyzed on the surface of the liquid jet to be analyzed,

- means capable of collecting the light resulting from the interaction of the light pulses of the laser with the liquid jet to be analyzed,

- a spectroscope capable of operating within the range of frequencies at which are found the emission lines of the liquid to be analyzed, and being equipped so as to receive the interaction light collected by the beam of optical fibers,

- means capable of making the liquid to be analyzed circulate in the form of a jet, and

- means capable of making the gas circulate in the form of a jet before flowing tangentially to the liquid to be analyzed.

11. Device in accordance with claim 10, characterized in that the means capable of collecting the emission light of the liquid to be analyzed is such that this light is collected colinearly with the excitation laser beam,

- and in that the device comprises an impermeable enclosure in which are found the liquid to be analyzed and the means capable of generating the laminar gas jet,

- the colinearity of the excitation laser beam and the direction of the collected light making possible the use of only one port of the enclosure for the laser beam and the collected light.